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DISHWASHING MACHINE

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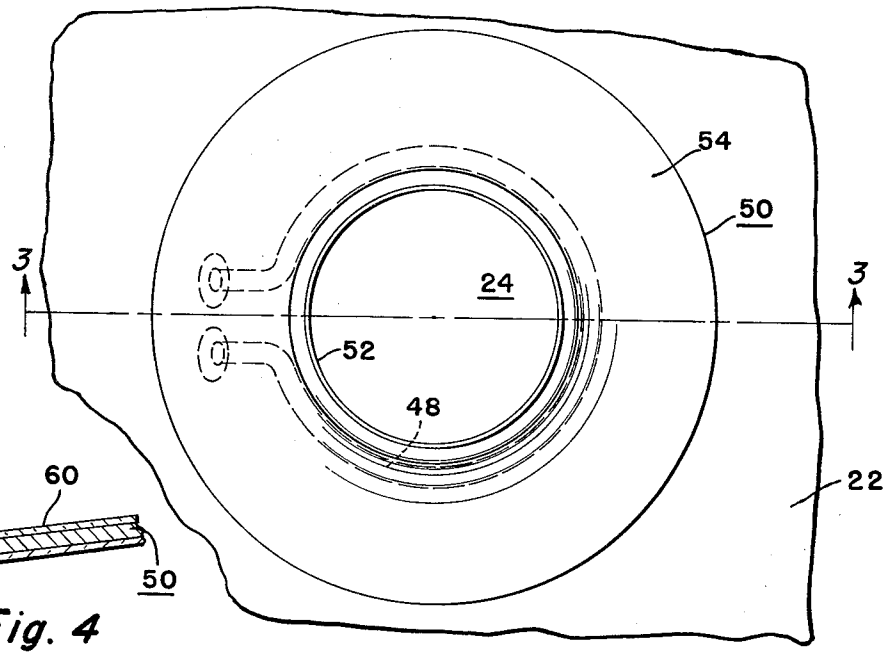



Fig. 4

Fig. 2

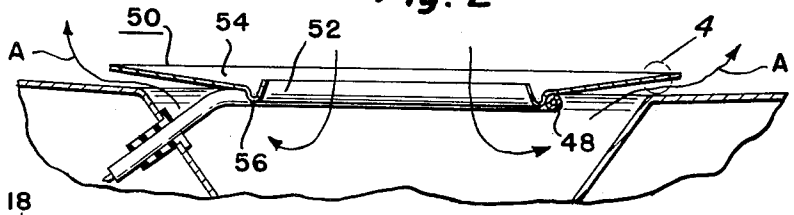



Fig. 3

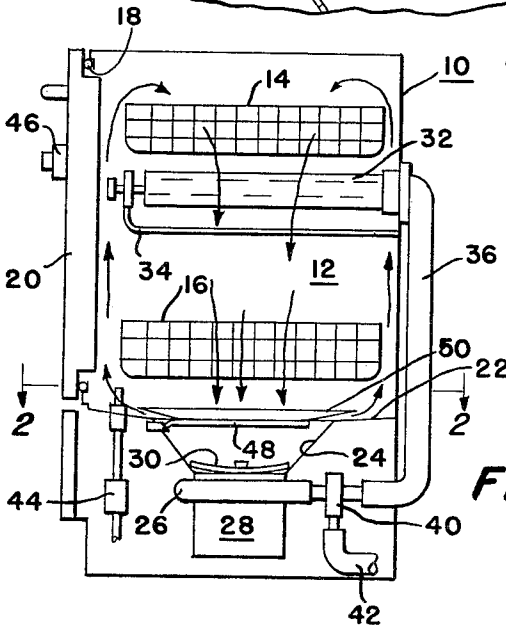



Fig. 1

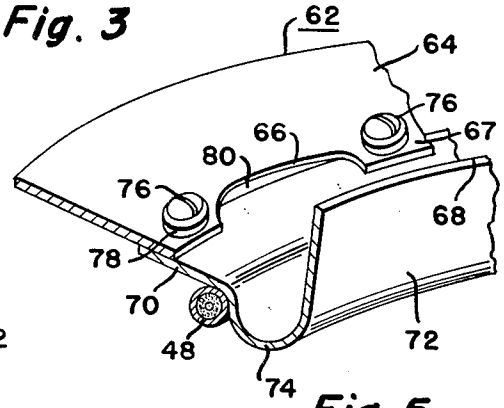



Fig. 5

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# DISHWASHING MACHINE

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This invention relates to a domestic appliance and more particularly to a device for preventing the formation of hard water spots on dishes which have been washed in an automatic dishwasher.

In certain localities of the country, the water supplied to dishwashing apparatus contains minerals and other foreign matter. This hard water presents a particular problem when used in conventional automatic dishwashers in that such water leaves spots on the dishes and other utensils when the dishwashing cycle is completed. These spots occur when droplets of water containing such foreign matter are evaporated during the drying portion of a dishwashing cycle.

Accordingly, it is an object of this invention to eliminate the formation of hard water spots on dishes or the like washed in an automatic dishwasher.

It is also an object of this invention to provide a steam bathing operation between the final rinse and the drying period of a dishwashing cycle.

A more specific object of this invention is the provision of an annular, saucer-shaped baffle resting in intimate contact with a dishwasher heating element for catching liquid during the washing and rinsing portions of a dishwashing cycle and subsequently vaporizing said liquid in a steam bathing operation, said baffle and said heating element cooperating after said steam bathing operation to create thermal drafts within the dishwasher which aid in drying.

Another object of this invention is to provide in a steam bathing apparatus for a dishwasher an annular baffle removably seated on a heating element and having a radially inner trough terminating outwardly in a gently sloping flange for flushing the trough and dissipating the heat of the heating element.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a schematic side sectional view of a dishwasher suitable for use with this invention;

FIGURE 2 is a fragmentary plan view taken along line 2—2 in FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken along line 3—3 in FIGURE 2;

FIGURE 4 is an enlarged detail of the baffle section 4 seen in FIGURE 3; and

FIGURE 5 is a fragmentary perspective of another embodiment of this invention.

In accordance with this invention and with reference to FIGURE 1, a conventional domestic dishwasher **10** is illustrated. The dishwasher **10** is comprised of a casing forming a dishwashing chamber **12** in which are supported in any suitable fashion a pair of support baskets **14** and **16** for supporting dishes or the like during a dishwashing cycle. The dishwashing chamber **12** has a front opening **18** which is closed by a horizontally pivotally hinged door **20**. The bottom of the dishwashing chamber **12** is closed by a bottom wall **22** in a portion of which is a water retaining generally conical sump **24**. The sump **24** opens at its bottom end into the inlet of a pump **26** driven by a motor **28**. Any suitable strainer **30** may be positioned over the inlet to the pump **26** for filtering the



washing liquid before it enters the pump and is redistributed over the surface of the dishes.

The water distribution system for the dishwashing chamber **12** includes a spray tube **32** rotatably mounted within the chamber on a support bracket **34** and receiving water or washing liquid from a supply conduit **36** at the rear of the dishwasher. Disposed between the supply conduit **36** and the outlet of the pump **26** is a diverter valve **40** which is adapted by way of solenoid operation to direct water either to the supply conduit **36** or drain **42** leading to any suitable sanitary sewer. Water for the distribution system is supplied by way of a water valve **44** which may be periodically energized in accordance with a sequential dishwasher timer shown generally at **46**.

For heating water within the sump **24** and for selectively drying the dishes, an annular tubular sheathed heating element **48** is supported by terminal end portions on a wall of the sump and suspended within an upper portion of the sump so that it may be selectively inundated by water supplied to the sump by the valve **44**.

A dishwashing cycle suitable for use with the teachings of this invention will include the sequential timer **46** which will selectively operate the water valve **44**, the motor **28** and the diverter valve **40**. More particularly, a dishwashing cycle may include a first period of washing wherein water is supplied to the sump **24** by the supply valve **44**. After the sump **24** is filled to the desired level, the motor **28** is energized to direct water to the supply conduit **36** and the spray tube **32** which will rotate in response to a swirl of water within the spray tube. Of course, a detergent of any suitable kind may be placed manually or mechanically within the dishwashing chamber **12** prior to the start of the dishwashing cycle. After the washing fluid of water and detergent is circulated about the dishwashing chamber **12** for a predetermined period of time, the diverter valve **40** is actuated along with the pump motor **28** to direct the soiled wash water to drain. Then the diverter valve **40** is positioned to close the drain and the water supply valve **44** energized to again refill the sump **24** with rinse water. This clear rinse water will be pumped to the spray tube **32** and will impinge over the surfaces of the dishes, thereby flushing the soiled washing liquid from the surface of the dishes. One or more rinsing operations may be provided in accordance with conventional design procedures.

Subsequent to the spray rinse distribution operation, the diverter valve **40** is again actuated along with the pump motor **28** to direct the used rinse water to the drain line **42**. Throughout the various washing and spray rinse portions of the dishwashing cycle, the heater **48** may be energized intermittently in order to maintain the temperature of the water within the sump **24** at a desired level.

After the last spray rinse and after the water is drained from the sump **24**, the heater **48** may be energized continuously to dry the dishes as the last portion of the dishwashing cycle. In prior art dishwashers which have been installed in hard water areas, the droplets remaining on the dishes at the conclusion of the final rinse evaporate from the heat of the heating means **48** and leave an unsightly mineral residue or hard water spot. It is to the elimination of this problem that the present invention is directed.

To facilitate an improved dishwashing result, a steam bathing cycle is interposed between the final rinse spray portion of the cycle and the dish drying portion of the cycle. For this reason a steam generator baffle **50** is adapted to be removably positioned on top of the heating element **48**. The steam generator baffle **50** is so configured to form an annulus or ring-shaped, open center saucer. This baffle **50** includes an upturned radially inner flange **52** and a radially outer slightly upwardly sloping outer flange **54**. Between the flanges **52** and **54**, and in-

tegral therewith is formed a generally U-shaped annular trough 56, the radially outer side of which nests in closely adjacent heat exchange relationship with the inside of the annular tubular heating element 48.

Thus, whenever water is distributed or sprayed within the dishwashing chamber 12, a portion thereof will fall on the upper face of the baffle 50 and will flow by gravity downwardly along the slightly conical flange 54 into the annular trough 56. Although wash water will collect in the trough 56 as well as rinse water, it should be noted that the configuration of the baffle 50 will cause the last distributed water, namely the rinse water, to flow down the flange 54 and enter the trough from its radially outer side, thereby flushing the trough by forcing the previously caught water over the inner flange 52.

At the conclusion of the final rinse spray, the heater 48 will be energized to vaporize the rinse water which has collected in the trough 56. This vaporized water or steam will rise within the dishwashing chamber 12, enshroud the dishes and condense on the surfaces of the dishes being washed. The considerable supply of distilled condensate generated will flood the surfaces of the dishes and wash the mineral deposit containing droplets from the dish surfaces. Note that the distillation of the hard rinse water will free the steam generated of the impurities found in hard water so that the surfaces of the dishes will be exposed to the flushing or steam bathing effect of pure condensate. Note that the amount of condensate to be generated may be regulated by the height of the baffle flange 52.

Another problem is created in dishwashers having a bottom drying heater, such as 48, namely overheating of dishes in close proximity to the heater during the drying cycle. For instance, those dishes which are placed within the bottom support rack 16 range up to 50° F. hotter than those in the top rack 14 at the conclusion of the drying cycle. The baffle 50 will prevent direct heat radiation to the dishes from the heating element 48 and will serve to dissipate the heat more quickly from the heating element. An additional purpose is served by such rapid heat dissipation in that it tends to prevent overheating of the resistance element in the heater also, thereby enhancing the life of the heating element due to lower operating temperatures.

Still another function of the steam generator baffle 50 is facilitated by its shape which, in conjunction with the washing chamber 12, sets up a thermal air distribution within the dishwashing chamber to aid and expedite the drying cycle. More particularly, the upstanding annular central flange 52, the heater 48 and the radially outer flange 54 cooperate to produce a chimney effect. As the outer flange 54 is heated by the heating element 48, air currents will be stimulated which tend to flow upwardly along the upwardly sloping underside of flange 54 as shown by arrows A in FIGURE 3. This thermal action will produce a rather toroidal-shaped air flow within the chamber—the air returning to the sump 24 and heater 48 by way of the center, collar or flange 52 of the baffle. Thus, the relatively large radially outer flange 54 aids in the dissipation of heat from the heating element 48, initiates a toroidal air distribution within the chamber for speeding the drying process and equalizing temperatures within the chamber and flushes out the trough 56 to insure clean rinse water for the steam generation portion of the cycle.

The baffle 50 can be formed from a piece of plain sheet metal. As an aid to cleaning the baffle, the formed article may be coated with porcelain 60 as evidenced in FIGURE 4 wherein both sides of the baffle are coated.

Turning now to FIGURE 5, another embodiment 62 of the steam generator baffle is illustrated fragmentarily. The purpose of the modified baffle 62 is to improve the heat distribution by accentuating the chimney effect. Further, the steam generator baffle 62 provides for a stainless steel inner portion 68 in engagement with the heating element 48 rather than a porcelain surface. More particularly, the baffle 62 is comprised of a radially outer porcelain covered slightly conical sheet metal ring 64 which has a plurality of notches 66 and tabs 67 about its radially inner edge. A preformed annulus 68 of stainless steel is formed with a radially outer flange 70, a radially inner flange 72 and a trough 74 formed at the juncture of the flanges 70 and 72. The heighth of the flange or collar 72 will be determined in accordance with that necessary to produce the desired chimney effect. It may, of course, extend above the outer edge of flange 64.

The tabs 67 of the outer ring 64 overlap portions of the outer flange 70 of the stainless steel portion 68. Thus the adjacent annular ring portions 64 and 68 are joined by fastening means such as screws 76. Interposed between the head of the screw and the porcelain coated flange 64 is a washer 78 of felt or other suitable resilient material. Note that the assembly of the stainless steel ring 68 to the porcelain coated ring 64 leaves an opening 80 through which water will overflow from the trough 74. With this design, the inner flange 72 of the stainless steel portion may extend upwardly to the necessary distance required for proper chimney effect action in the dishwashing chamber. The amount of water retained in the trough 74 for the steam generation cycle will be determined by the heighth of the overflow opening 80. For more or less steam, the length and slope of the inner ring flange 70 may be adjusted to facilitate the retention of more or less water in the annular trough.

It should now be seen that an improved steam generating device has been provided for a dishwasher which will facilitate proper temperature distribution within the dishwashing chamber, shield the dishes from direct radiation, add to the life of the heating element, and produce a toroidal-shaped air flow in the dishwashing chamber to speed the drying process.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of washing, rinsing, steam bathing and drying, means for distributing a liquid in said chamber during said periods of washing and rinsing, annular means for heating in said chamber during said period of steam bathing and drying, and removable, annular trough means in nested heat exchange relationship with said annular heating means for catching a portion of said liquid during one of said washing and rinsing periods for subsequent release in the form of distilled water vapor during said steam bathing period, said trough means being defined partially by a generally radially outwardly and upwardly directed flange overlying and extending beyond said heating means for dissipating the heat from said heating means and creating a toroidal thermal distribution of air in said chamber during said drying period.

2. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of washing, rinsing, steam bathing and drying, means for distributing a liquid in said chamber during said periods of washing and rinsing, means for heating in said chamber during said period of steam bathing and drying, and trough means in nested heat exchange relationship with said heating means for catching a portion of said liquid during one of said washing and rinsing periods for subsequent release in the form of distilled water vapor during said steam bathing period, said trough means being defined partially by a sloping flange overlying and extending beyond said heating means for dissipating the heat from said heating means and creating

a thermal distribution of air in said chamber during said drying period.

3. The combination of claim 2 wherein said sloping flange includes an opening for limiting the amount of liquid caught by said trough means.

4. The combination of claim 2 wherein said sloping flange includes a stainless steel portion next to said heating means and a porcelain coated portion extending into engagement with said stainless steel portion at spaced points to form an overflow opening therewith for limiting the amount of liquid caught by said trough means.

5. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of washing, rinsing, steam bathing and drying, means for distributing a liquid in said chamber during said periods of washing and rinsing, annular means for heating in said chamber during said period of steam bathing and drying, and removable, annular trough means in nested heat exchange relationship with said annular heating means for catching a portion of said liquid during one of said washing and rinsing periods for subsequent release in the form of distilled water vapor during said steam bathing period, said trough means being defined by a radially inner trough beside said heating means and an integral generally radially outwardly and upwardly directed annular flange between said heating means and said supporting means and extending beyond said heating means for dissipating the heat from said heating means and creating a toroidal thermal distribution of air in said chamber during said drying period.

6. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of washing, rinsing, steam bathing and drying, means for distributing a liquid in said chamber during said periods of washing and rinsing, annular means for heating in said chamber during said period of steam bathing and drying, and removable, annular trough means in nested heat exchange relationship with said annular heating means for catching a portion of said liquid during one of said washing and rinsing periods for subsequent release in the form of distilled water vapor during said steam bathing period, said trough means having a radially inner stainless steel ring defining a channel in heat transfer relationship with said heating means and a generally radially outwardly directed porcelain coated ring connected at spaced points to said stainless steel ring and extending radially and upwardly slopingly beyond said heating means for dissipating the heat from said heating means and creating a toroidal thermal distribution of air in said chamber during said drying period.

7. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of rinsing and steam bathing, means for distributing a liquid in said chamber during said rinsing period, means for heating in said chamber during said steam bathing period, and open top means in removable, dish-shielding, nested heat exchange relationship with said heating means for catching a portion of said liquid during said rinsing period for subsequent release directly therefrom in the form of distilled water vapor during said steam bathing period, said catching means including an upwardly sloping radiant heat baffling flange overlying said heating means on one side thereof and defining an opening on the other side thereof, the slope of said flange and the size of said opening being sufficient in cooperation with said heating means to initiate a thermal chimney effect in said chamber whereby thermal convection currents move upwardly along said flange away from said heating means and return to said heating means through said opening.



8. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of rinsing and steam bathing, means for distributing a liquid in said chamber during said rinsing period, means for heating in said chamber during said steam bathing period, and open top means in radiant heat baffling, nested heat exchange relationship with said heating means for catching a portion of said liquid during said rinsing period for subsequent release directly therefrom in the form of distilled water vapor during said steam bathing period, said catching means including an upwardly sloping radiant heat baffling flange overlying said heating means on one side thereof and defining an opening on the other side thereof, the slope of said flange and the size of said opening being sufficient in cooperation with said heating means to initiate a thermal chimney effect in said chamber whereby thermal convection currents move upwardly along said flange away from said heating means and return to said heating means through said opening.

9. In combination with a casing forming a dishwashing chamber, means in said chamber for supporting dishes or the like during a dishwashing cycle including periods of rinsing and steam bathing, means for distributing a liquid in said chamber during said rinsing period, means for heating in said chamber during said steam bathing period, and means in removable, overlying heat exchange relationship with said heating means for catching a portion of said liquid during said rinsing period for subsequent release in the form of distilled water vapor during said steam bathing period, said catching means including a first portion forming a trough and having an upstanding wall and a radial flange and a second portion connected to said flange and forming therewith spaced openings for limiting the depth of water in said trough.

10. In combination with a dishwasher heating means and water distribution means, a baffle in water receiving relationship to said distribution means comprising, a sloping flange having an outer terminus and an inner terminus lower than said outer terminus for catching water directly from said distribution means, and a receptacle contiguous to said inner terminus for gravitationally receiving said water from said flange and adapted to lay in heat exchange relationship to said heating means for vaporizing said water.

11. In combination with a dishwasher heating means and water distribution means, a baffle in water receiving relationship to said distribution means comprising, an annular sloping flange portion having an outer edge and an inner edge lower than said outer edge for catching water directly from said distribution means, and an annular receptacle portion contiguous to said inner edge for gravitationally receiving said water from said flange and adapted to lay in heat exchange relationship to said heating means for vaporizing said water.

12. In combination with a dishwasher heating means and water distribution means, a baffle in water receiving relationship to said distribution means and in heat exchange relationship to said heating means comprising, a conical ring for catching water directly from said distribution means and having a notch, and an imperforate annular trough contiguous to the inside of said ring for gravitationally receiving said water from said ring and from which said water may be vaporized and having a flange forming an opening with said notch for limiting the amount of water received and a collar extending axially beyond said opening.

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